

Higher

GCSE

Biology B Twenty First Century Science

J257/03: Breadth in Biology (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. Crossed-Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.
7. There is a NR (**No Response**) option. Award NR (No Response):
 - if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
 - OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in *italics*) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in *italics*) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

13. Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

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Mark Scheme

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The breakdown of Assessment Objectives for GCSE (9-1) in Biology B:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

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Question			Answer	Marks	AO element	Guidance
1	(a)		1/3✓	1	1.2	
	(b)		Any one from: Idea of restricting/banning hunting/poaching ✓ Idea of nature reserves/national parks/creating protected areas ✓ Idea of preserving/protecting/restoring habitats / protecting food sources/supplementary feeding ✓ Idea of breeding programmes ✓ Idea of reducing predation ✓ Stop illegal trade in ivory ✓ Reduce (named examples of) human elephant conflict ✓ Idea of veterinary care e.g. vaccination ✓ Idea of ecotourism ✓	1	2.1	ALLOW any sensible suggestion ALLOW suggested methods e.g. rangers and tracking ALLOW conservation park ALLOW zoo ALLOW named examples of habitat protection e.g. reducing deforestation ALLOW idea of protecting water supply IGNORE climate change ALLOW selective breeding, (named) assisted reproductive techniques, breed them ALLOW collect sperm and eggs, idea of gene bank IGNORE increasing reproduction unqualified

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Question			Answer	Marks	AO element	Guidance
	(c)	(i)	Any one from: Idea that it could spread (to other individuals/other species/kill more elephants) ✓ Idea that it may be present in other species and could cause their death ✓ Idea that bacteria will/more likely to enter blood as temperature gets warmer/increases/global warming ✓ Idea that we are not able to (easily) control the temperature/environment/conditions to reduce likelihood of bacteria entering blood ✓ Idea of more elephant deaths/more elephants affected as temperature increases/global warming ✓ Becoming more endangered/extinct ✓ Idea that the bacteria might evolve/mutate ✓ Idea there is no vaccine/antibiotics may not work ✓ Idea that once in the blood it may be too late to treat ✓	1	2.1	ALLOW any sensible suggestion ALLOW it is communicable/contagious IGNORE it is infectious DO NOT ALLOW inherited by offspring IGNORE climate change unqualified ALLOW critically endangered IGNORE no cure/treatment ALLOW idea of high risk/danger because elephants only need to get the disease <u>once</u> and it causes death
		(ii)	White blood cells ✓	1	1.1	
		(iii)	Antibodies ✓	1	1.1	

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Question			Answer	Marks	AO element	Guidance
	(d)		Any two from: Use disinfectant/alcohol/named disinfectant/antibacterial to prepare/sterilise/sanitise the area ✓ Wash hands with antibacterial/wear gloves/PPE/lab coat/visor ✓ Use sterile agar ✓ Use sterile/autoclaved equipment ✓ Flame the top of the bottle ✓ Keep lid on petri dish when not spreading bacteria ✓ Only open the lid of the petri dish a little bit/open the lid facing away from you/open the lid quickly/AW ✓ Working close to a Bunsen burner/flame/ work in extractor cabinet ✓	2	3.3b	IGNORE sterilise/sanitise unqualified IGNORE clean the area or spray disinfectant unqualified ALLOW mask ALLOW gamma radiation qualified ALLOW flame the glass spreader ALLOW heat/burn/fire for flame IGNORE put ethanol on the spreader IGNORE refs to taping of dish, putting dish upside down, labelling, incubation temperature
	(e)		E B ✓ D C ✓	2	1.1	Order must be correct
	(f)		(Alfred Russel) Wallace ✓	1	1.1	

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Question			Answer	Marks	AO element	Guidance														
2	(a)	(i)	4 correct plots ✓	1	2.1	Tolerance +/- half a square <table><tr><th>Temperature (°C)</th><th>Concentration of ethanol (g/l)</th></tr><tr><td>25</td><td>13</td></tr><tr><td>30</td><td>28</td></tr><tr><td>35</td><td>30</td></tr><tr><td>40</td><td>35</td></tr><tr><td>45</td><td>33</td></tr><tr><td>50</td><td>30</td></tr></table>	Temperature (°C)	Concentration of ethanol (g/l)	25	13	30	28	35	30	40	35	45	33	50	30
Temperature (°C)	Concentration of ethanol (g/l)																			
25	13																			
30	28																			
35	30																			
40	35																			
45	33																			
50	30																			
		(ii)	Curve of best fit ✓	1	1.2	Line must be a curve. Line should be a smooth solid single line that: • passes exactly through the plots at 30°C or 35 °C OR between the plots at 30°C and 35 °C, • through the plot at the optimum (ALLOW half a square tolerance), • then curves down through final two plots (ALLOW 1 full square tolerance). DO NOT ALLOW extrapolation DO NOT ALLOW multiple lines DO NOT ALLOW plot-to-plot lines														
	(b)		Any two from: As temperature increases the concentration/production/ethanol increases and then decreases ✓ Identifies 40 (°C) as the optimum/the peak/point at which it decreases ✓ Explanation that enzymes begin to denature above 40 (°C) ✓	2	3.1a	IGNORE heat IGNORE amount ALLOW the highest concentration of ethanol was produced at 40 (°C) / 40 (°C) is the best temperature for fermentation ALLOW for 2 marks - As the temperature increases														

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Question			Answer	Marks	AO element	Guidance
						the concentration of ethanol increases up to 40 (°C) and then it decreases
	(c)		Carbon dioxide ✓	1	1.1	ALLOW CO ₂
	(d)		(dependent variable) Volume of gas/carbon dioxide produced ✓ (independent variable) Sugars/type of sugar/sugar solution/sucrose and glucose and galactose ✓ (control variable) Any one from: Temperature ✓ Volume of sugar solution ✓ Concentration of sugar solution ✓ pH ✓ Mass/concentration of yeast, species/type of yeast ✓ Length of time allowed to respire ✓ Thickness of layer of oil ✓	3	1.2	ALLOW ml/cm³ ALLOW ECF from part (c) (if a gas is identified) DO NOT ALLOW amount for volume of gas ALLOW any other correct control variables DO NOT ALLOW volume of gas/carbon dioxide or type of sugar IGNORE keep the equipment the same IGNORE room temperature ALLOW volume/amount/depth of water in the water bath ALLOW mass of sugar

Question			Answer	Marks	AO element	Guidance
3	(a)		Tuna ✓	1	2.1	ALLOW shark / marlin
	(b)		(copepods) decrease because: Mackerel will have less food ✓ So will feed on more copepods ✓ OR (copepods) increase because: Mackerel will have less food ✓ So there will be fewer mackerel to feed on copepods ✓ OR (copepods) decrease because: Population of tuna will decrease because they have less food ✓ So the population of mackerel will increase and eat more copepods ✓ OR (copepods) increase because: Tuna will have less food ✓ Tuna will feed on more mackerel ✓ OR (copepods) increase because: Less <u>competition</u> ✓ For food/phytoplankton ✓ OR (copepods) increase because: Fewer shrimp eating phytoplankton ✓ So copepods would have more to eat ✓	2	2.1	DO NOT ALLOW no competition IGNORE any other named food source

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Question			Answer	Marks	AO element	Guidance
						If no marks awarded ALLOW copepods decrease because there is more Competition for food = 1 mark
	(c)		Any one from: Space/habitat/territory ✓ Shelter ✓ Mates/partners ✓	1	1.1	ALLOW places to reproduce IGNORE predation and food availability or references to water and oxygen and light.
	(d)		Any three from: Mercury builds up in (the tissues of) each organism / is not excreted/bioaccumulation ✓ Idea that mercury is passed along a food chain/passed on by feeding/to move the next trophic level ✓ Idea that amount/concentration of mercury in the organisms increases as you go higher up the food chain/to higher trophic levels ORA ✓ Idea that a large amount of mercury in tuna is harmful (to human health) ORA ✓	3	2.1	ALLOW food web for food chain ALLOW ref. to biomagnification ALLOW idea that predator eats many prey so receives more mercury for 2 marks for mp 2 and 3
	(e)		Any two from: Weak correlation/no clear trend ✓ Large spread/scatter/range/ lack of precision of blood pressure (for most concentrations) ✓ Blood pressure can be affected by other factors ✓ Most people in the study have a low blood pressure/below normal/below 120-129 ✓	2	3.2a	ALLOW no correlation/trend ALLOW description of scatter or range for one concentration IGNORE the idea that an individual data point disproves the link

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Question			Answer	Marks	AO element	Guidance
			Mercury consumption has not been measured/they have only measured concentration of mercury in hair ✓ Data is not representative of population/sample size is too small ✓			ALLOW little data in the higher concentration range

Question			Answer	Marks	AO element	Guidance
4	(a)		To obtain water/xylem transport water ✓ OR To obtain mineral ions/ xylem transport mineral ions ✓	1	2.1	ALLOW named example e.g. nitrate IGNORE nutrients unqualified DO NOT ALLOW sugar
	(b)		Any three from: <i>Cuscuta</i> cannot photosynthesise ✓ Cannot produce glucose/sugars ✓ To obtain/phloem transport glucose/sugars ✓ Idea that glucose is needed for respiration/growth ✓	3	2.1	IGNORE starch ALLOW amino acids ALLOW amino acids are needed for growth IGNORE ref to roots IGNORE water, mineral ions IGNORE food, nutrients unqualified
	(c)		Stomata ✓	1	1.1	ALLOW guard cells
	(d)	(i)	Potometer ✓	1	1.2	
		(ii)	Time ✓ Change in volume of water (indicated by the movement of the air bubble) ✓	2	1.2	ALLOW starting and end positions of bubble OR distance moved by air bubble
	(e)			2	1.1	3 correct ticks = 2 marks

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Question			Answer			Marks	AO element	Guidance
				Low transpiration rate	High transpiration rate			2 correct ticks = 1 mark
			High light intensity		✓			
			High windspeed		✓			
			Low temperature	✓				
						✓✓		

Question			Answer				Marks	AO element	Guidance				
5	(a)		Any two from: Species are interdependent ✓ First example of interdependence ✓ Second interdependence ✓ Idea that all living things have a right to live/ ethical reasoning ✓ Economic reason described e.g. provide ecotourism ✓ Maintaining population size/reducing chance of extinction ✓ Maintaining (genetic) variation ✓ Reason why genetic variation is important✓				2	1.1	ALLOW any sensible suggestion e.g. pollination, seed dispersal, food, habitat, cycling of nutrients, soil fertility, ecosystem services, medicines, materials e.g. resilience to disease, allowing species to adapt/evolve IGNORE sustainability unqualified				
	(b)	(i)	Active transport ✓				1	1.1					
		(ii)	<table><tr><td>Only Nitrogen</td><td>Only Phosphates</td><td>Both nitrogen</td><td>Neither</td></tr></table>				Only Nitrogen	Only Phosphates	Both nitrogen	Neither	2	1.1	ALLOW only phosphates for DNA 3 ticks = 2 marks 2 ticks = 1 mark
Only Nitrogen	Only Phosphates	Both nitrogen	Neither										

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Question			Answer					Marks	AO element	Guidance
						and phosphates				
			Glucose				✓			
			DNA			✓				
			Protein	✓						
								✓✓		
		(iii)	Line increasing as temperature increases ✓ Line decreasing as temperature gets higher ✓					2	2.1	DO NOT ALLOW a line that levels
		(c)	Any three from: (Some) microorganisms/decomposers could not survive (in acidic conditions/low oxygen) ✓ Enzymes become denatured ✓ Active site changes shape ✓ Active site no longer complementary to substrate/substrate will not fit active site ✓ Idea that low oxygen limits (aerobic)respiration in microorganisms/favours anaerobic respiration ✓					3	2.1	

Question			Answer	Marks	AO element	Guidance
6	(a)		Hormone FSH LH Progesterone Function Causes an egg to mature in an ovary and stimulates the ovaries to release oestrogen. Prepares the lining of the uterus for implantation of a fertilised egg. Triggers ovulation. ✓✓	2	1.1	3/2 lines correct = 2 marks 1 line correct = 1 mark IGNORE any box with two lines
	(b)		Any two from: Vasodilation/increased blood flow to the surface (capillaries) of the skin ✓ (Increase in amount of) sweat /sweat evaporates ✓	2	1.1	DO NOT ALLOW vasodilation of capillaries or veins or blood vessels move closer to the surface IGNORE Blood vessels dilate

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Question			Answer	Marks	AO element	Guidance
			Hair erector muscles relax / hairs lie flat ✓			
	(c)	(i)	First check the answer on the answer line. If answer = 6 award 1 mark $3.2 \div 0.5 = 6.4$ $= 6 \text{ days } \checkmark$	1	2.1	
		(ii)	Any one from: Idea that the absorption rate is an approximate – so it could run out quicker for some women ✓ Idea that over time the patch could detach from the skin so the whole patch may not deliver the hormone ✓ Easier to remember to take it on the same days so less likely that will forget and go without hormones/or if do forget would still be getting hormones ✓ The hormones in the patch would not last a whole week ✓	1	3.1a	ALLOW any sensible suggestion.
	(d)		Any three from: Test for safety in healthy people/women with decreasing hormone levels AW ✓ Test for side effects in healthy people/women with decreasing hormone levels AW ✓ Test for dosage in healthy people/women with decreasing hormone levels AW ✓ Test for effectiveness in women with decreasing hormone levels AW ✓	3	1.1	IGNORE tests on animals

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Question			Answer	Marks	AO element	Guidance
			idea of comparing to a placebo/current treatment for effectiveness/side effects ✓ idea of the use of (double) blind trials to reduce bias/check for placebo effect ✓			ALLOW If no other mark awarded, award 1 mark for tests are conducted on healthy people and women with decreasing hormone levels

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	First check the answer on the answer line. If answer = 634 award 3 marks Any number x 60 OR 660 ✓ Correct method for finding 96% of 660 OR 96% of 11 OR 10.56 ✓ 634 ✓	3	2.2 x 2 1.2	MAX 2 if final answer is incorrect ALLOW 26.4 for 1 mark e.g. 11×0.96 , $660 - (0.04 \times 660)$ ALLOW 2 marks for 633.6 seen ALLOW 2 marks for 26 ALLOW 1 mark for clear evidence of incorrect answer correctly rounded to whole number
		(ii)	Any one from: Chromosomes/ DNA copy/double/replicates ✓ More cytoplasm/organelles/named organelles made ✓	1	1.1	DO NOT ALLOW events that occur in mitosis IGNORE genetic material/information ALLOW DNA/chromosome duplicates IGNORE contents of cell duplicates

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Question			Answer	Marks	AO element	Guidance
			Cell grows (larger) ✓			ALLOW ribosomes DO NOT ALLOW nucleus IGNORE subcellular structures unless qualified
	(b)	(i)	First check the answer on the answer line or in table. If answer = 0.146 award 2 marks 28 ÷ 192 = 0.1458333 ✓ 0.146 ✓	2	1 x 2.2 1 x 1.2	ALLOW 1 mark for 0.145(8333) ALLOW 1 mark for clear evidence of incorrect answer correctly rounded to 3 decimal places
		(ii)	(High mitotic index) suggests many cells are dividing ✓ Tumour is the result of uncontrolled cell division ✓	2	2.1	IGNORE cells are dividing rapidly IGNORE tumours are caused by uncontrolled cell growth
		(iii)	(Tissue sample) B ✓	1	3.2b	
		(iv)	Sample from different parts of the tumour/centre and outside the tumour/idea of random sampling ✓ Calculate mean (mitotic index) ✓	2	3.3a	IGNORE average, mode and median ALLOW a description of how to calculate a mean
	(c)		Any one from: Idea that the number of cells in the sample was too small/the cells were not representative of the tumour/the mitotic index calculated may not be accurate ✓ Some harmful tumours used to calculate the mitotic mean may have a mitotic index lower/higher than 0.8 ✓	1	3.1b	

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Question			Answer	Marks	AO element	Guidance
			Non harmful tumours can have a high mitotic index/not all non-harmful tumours have a low mitotic index ✓			ALLOW idea that the harmfulness of a tumour also depends on the location of the tumour in the body/if it spreads
	(d)		Any one from: cancer cannot be transmitted AW ✓ caused by (named) lifestyle factors/genetic factors/mutation ✓	1	1.1	DO NOT ALLOW spread unqualified ALLOW not caused by a pathogen/named pathogen

Question			Answer	Marks	AO element	Guidance
8	(a)		A section of DNA that codes for (the production of) a protein(s) ✓	1	1.1	ALLOW a sequence of bases that codes for a protein ALLOW a region/section of a chromosome that codes for a protein
	(b)		Diabetes ✓	1	1.1	IGNORE type 1 / type 2
	(c)		Vector ✓	1	2.1	
	(d)		Complementary base pairing ✓	1	2.1	ALLOW A pairs with T and C pairs with G
	(e)	(i)	First check the answer on the answer line. If answer = 7680 award 2 marks Evidence of 6 rounds of cell division/6 lots of 20 minutes in the calculation ✓ 7680 ✓	2	2.2	

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Question			Answer	Marks	AO element	Guidance
		(ii)	(Population) will decrease ✓	1	3.2b	ALLOW the line would go down

J257/03 Question			Mark Scheme Answer	Marks	AO element	June 2025 Guidance
9	(a)	(i)	Parents without thalassemia have a child with thalassemia/ if it was dominant at least one parent would have thalassemia in order to have a child with thalassemia ✓ Parents must be heterozygous/ Tt/ have one recessive allele/be a carrier ✓ Parents have one offspring/W who inherits one recessive allele from each parent/two recessive alleles/W is homozygous recessive/tt ✓	3	3.1b	ALLOW it cannot be dominant because P and Q do not have thalassemia so none of the children would have thalassemia. IGNORE it has skipped a generation ALLOW any letters as not given in question (case must be correct) IGNORE gene unqualified ALLOW clear evidence from a punnet square that child W has inherited two recessive alleles from two heterozygous parents = 2 marks
		(ii)	First check the answer on the answer line. If answer = 0(%) award 3 marks Evidence of tt ✓ crossed with TT ✓ 0(%) ✓	3	2.1	ALLOW any letters as not given in question (case must be correct) ALLOW ECF for correct probability from their incorrect working
	(b)	(i)	Transport oxygen AW ✓	1	1.1	
		(ii)	Any one from: Tiredness/fatigue✓ Shortness of breath✓ Dizziness/lightheaded ✓ Pale skin✓ Irregular heartbeat ✓ Muscle cramps ✓ Anaemia ✓	1	2.1	ALLOW any sensible suggestions ALLOW iron deficiency/high iron levels

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Question			Answer	Marks	AO element	Guidance
	(c)	(i)	Bases ✓ Amino acids ✓ Active site ✓	3	1.1	
		(ii)	DNA that does not store instructions for making a protein ✓	1	1.1	
		(iii)	Any two from: ref to gene <u>expression</u> /genes being <u>expressed</u> ✓ idea that affects when/if/which particular genes are used/ when/if/which particular proteins are made / how much of a protein is made ✓ idea that lack of/too much of a particular protein/enzyme can affect characteristics / lead to a genetic disorder ✓	2	1.1	ALLOW idea that mutation affects gene(s) switching on/off DO NOT ALLOW ref to structure/shape/function of a protein being affected

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